

On page 10, line 2, delete the comma after "dice";
On page 10, line 4, after "patterns" insert --34A, 34B--;
On page 10, line 13, insert a comma after "(PCB)";
On page 10, line 17, delete the comma after "encapsulation";
On page 21, line 3, change "are" to --is--;
On page 21, line 4, delete the comma after "style";
On page 21, line 6, change "the opposite" to --one--; and after "side" (first occurrence), insert --of the substrate--; and
On page 21, line 7, after "of" insert --a--.

IN THE CLAIMS:

Please amend claims 1, 2, 5, 7-21, 23, 24, 26, 28-37, 39, 40, 42, 44-49, 51, 52 & 54 as follows:

1. (Amended) A multi-chip module, comprising:
a substrate having a first side and a second side and at least two elongate through-slots extending from the first side to the second side thereof, said at least two through-slots having a length and a width;
electrical conductors formed on said first side and said second side of said substrate, said electrical conductors having connection terminals adjacent said at least two elongate through-slots for bonding portions of wires to bond pads exposed through said at least two elongate through-slots;
electrical input/output connectors for connecting said electrical conductors to an external circuit;
a first semiconductor die having an active surface with a plurality of bond pads thereon, and a reverse surface, a portion of said active surface bonded to said first side of said substrate, at least one bond pad of the plurality of [conductive] bond pads on the active surface of the first semiconductor die exposed through a through-slot of said at least two through-slots in said substrate for bonding a portion of a wire to at least one of said electrical [conductor] conductors on said second side of said substrate;

a second semiconductor die having an active surface with a plurality of bond pads thereon, and a reverse surface, a portion of said active surface of said second semiconductor die bonded to said first side of said substrate, at least one bond pad of the plurality of bond pads thereon exposed through [a] another through-slot of said at least two through-slots in said substrate for wire-bonding to at least one of said electrical [conductor] conductors on said [first] second side of said substrate; and

at least two conductive wires connecting at least two bond pads of said plurality of bond pads on said first semiconductor die and said second semiconductor die to at least two of said connection terminals, one of said at least two connection terminals located on the first side of said substrate and the other of said at least two connection terminals located on the second side of said substrate, said first semiconductor die and said second semiconductor die positioned wherein a conductive wire connected thereto extends through a through-slot of said at least two through-slots in said substrate.

In claim 2, line 1, after "comprising" insert --a--; and

In claim 2, line 2, after "two" insert --elongate--.

5. (Amended) The multi-chip module of claim 1, wherein said electrical conductors on said first side of said substrate have connection terminals adjacent [one] said through-slot of said at least two elongate through-slots in said substrate for wire-bonding to said plurality of bond pads on said first semiconductor die attached to said second side of said substrate, and said electrical conductors on said second side of said substrate have connection terminals adjacent said another through-slot of said at least two elongate through-slots for wire-bonding to said plurality of bond pads on said second semiconductor die attached to said first side of said substrate.

In claim 7, line 2, delete "and" and after "connecting" insert --said--.

94 8. (Amended) The multi-chip module of claim 1, wherein said electrical input/output connectors comprise a ball-grid-array of solder balls on one [side] of said first and second sides of said substrate.

In claim 9, line 1, after "electrical" insert --input/output--; and

In claim 10, line 1, after "electrical" insert --input/output--.

95 11. (Amended) A multi-chip module, comprising:
a substrate having a first side, a second side, and a plurality of elongate through-slots extending from the first side to the second side thereof, said plurality of through-slots having a length and width;
electrical conductors formed on said first side and said second side of said substrate and having connection terminals adjacent said plurality of through-slots for wire-bonding to bond pads exposed through said plurality of through-slots;
electrical input/output connectors for connecting said electrical conductors to an external circuit;
a plurality of semiconductor dice, each semiconductor die of said plurality of semiconductor dice having an active surface having a plurality of bond pads thereon and a reverse surface, [a plurality of] said active surface bonded to said first side of said substrate, the plurality of bond pads of each semiconductor die exposed through a through-slot of said plurality of through-slots to said second side of said substrate for wire-bonding to said electrical conductors on said second side of said substrate, at least one semiconductor die of said plurality of semiconductor dice attached to said second side of said substrate, the plurality of bond pads of said at least one semiconductor die of said plurality of semiconductor dice exposed through a through-slot of said plurality of through-slots to said first side of said substrate for wire-bonding to said electrical conductors on said first side of said substrate; and
conductive wires connecting said plurality of bond pads of each of said plurality of [said] semiconductor dice to said connection terminals, each said semiconductor die of said plurality of semiconductor dice positioned having conductive wires connected thereto

A5
Concl'd

[extend] ~~extending~~ through a through-slot of said plurality of through-slots in a space between adjacent ~~[spaced]~~ dice on [the] an opposite side of said substrate thereto.

In claim 12, line 1, after "comprising" insert --a--;

In claim 12, line 2, after "said" (first occurrence) insert --pluralities of--; and after "said" (second occurrence) insert --plurality of--;

In claim 13, line 2, after "between" insert --said--; and change "die" to --dice--;

In claim 14, line 2, after "said" insert --multi-chip--; and

In claim 15, line 1, after "said" insert --plurality of--; and change "are" to --is--.

A6

16. (Amended) The multi-chip module of claim 11, wherein said electrical conductors on said first side of said substrate have connection terminals adjacent alternate through-slots of said plurality of through-slots for wire-bonding to said plurality of bond pads on said at least one semiconductor die of said plurality of semiconductor dice attached to said second side of said substrate, and said electrical conductors on said second side of said substrate have connection terminals adjacent other through-slots of said plurality of through-slots for wire-bonding to said plurality of bond pads on semiconductor [die] dice of said plurality of semiconductor dice attached to said first side of said substrate.

In claim 17, line 2, after "and" insert --said--; and

In claim 18, line 2, after "substrate" delete "and".

A7

19. (Amended) The multi-chip module of claim 11, wherein said electrical [connection] input/output connectors [means] [comprises] comprise a ball-grid-array of solder balls on one [side] of said first and second sides of said substrate, in [the] a periphery thereof about said [attached] bonded semiconductor dice.

In claim 20, line 1, after "electrical" insert --input/output--;

In claim 21, line 1, after "electrical" insert --input/output--;

In claim 23, line 2, change "slot" to --slots--; change "the" to --a--; and after "said" (first occurrence), insert --plurality of--;

In claim 24, line 1, after "wherein" insert --each of--; after "said" insert --plurality of-- and change "slot" to --slots--; and

~~12~~ In claim 26, line 1, after "of" change "a" to --said--.

98 28. (Amended) The multi-chip module of claim 25, wherein said through-slot of said plurality of through-slots is beveled between said first side and second side of said substrate.

~~13~~ In claim 29, line 1, after "said" insert --plurality of--;

~~14~~ In claim 29, line 2, after "dice" change "are" to --is--;

~~15~~ In claim 29, line 3, after "surface" insert --thereof--;

~~16~~ In claim 30, line 2, change "die" at the beginning of the line to --dice--;

~~17~~ In claim 30, line 3, change "die" to --dice--; and

~~18~~ In claim 31, line 1, change "wherein said module comprises" to --further comprising--.

Sub B3 32. (Amended) A method for forming a high density multi-chip module, comprising the steps of:

providing a plurality of integrated circuit semiconductor dice, each semiconductor die of said plurality having an active surface having a plurality of bond pads thereon;

99 forming a substrate with opposing first and second sides, at least three elongate through-slots extending from said first side to said second side, each of said at least three [through-slot] through-slots configured for opposite side access between attached semiconductor [die] dice of said plurality of semiconductor dice [to] and the plurality of bond pads of a semiconductor die of said plurality of semiconductor dice bonded to said substrate;

forming a pattern of a plurality of electrical conductors associated with said substrate, at least one electrical conductor of said plurality of electrical conductors having a connection terminal adjacent a through-slot of said at least three through-slots for connecting said plurality of

B³
bond pads of a semiconductor die of said plurality of semiconductor dice to an input/output connector;

forming an input/output connector on said substrate and connecting said input/output connector to said plurality of electrical conductors;

attaching the active surfaces of a plurality of said plurality of semiconductor dice to [a] the first side of said substrate wherein the bond pads thereof are aligned with alternate through-slots of said at least three through-slots for access from the second side of said substrate;

A9
Concl'd
attaching the active surface of at least one semiconductor die of said plurality of semiconductor dice to said second side of said substrate, the plurality of bond pads of said at least one semiconductor die aligned with other alternate through-slots of said at least three through-slots for access from the first side of said substrate; and

wire-bonding said plurality of bond pads of each attached semiconductor die of said plurality of semiconductor dice to connection terminals adjacent the [corresponding] alternate through-[slot]slots.

In claim 33, line 1, delete "the step of";

In claim 33, line 2, change "slot" to --slots--;

In claim 34, line 2, after "said" insert --elongate--;

In claim 35, line 3, delete "the";

In claim 36, line 2, after "into" insert --each--;

In claim 37, line 2, after "between" delete "the" and change "die" to --dice--;

In claim 37, line 3, after "of" insert --each--;

In claim 39, line 1, after "32," insert --further-- and after "the" delete "further";

In claim 39, line 2, after "said" insert --plurality of--;

In claim 40, line 2, change "on" (first occurrence) to --associated with--; and

In claim 40, line 3, after "and" insert --said--.

A10
42. (Amended) The method of claim 4, wherein the step of forming an input/output connector comprises forming one of a ball-grid-array and a pin-grid-array on one of said first and

13

Q10
Conc'd

second sides of said substrate in a peripheral area surrounding said plurality of semiconductor dice.

sub
pl

44. (Amended) A method for forming a high density multi-chip module, comprising the steps of:

providing a plurality of integrated circuit dice, each die of said plurality having an active surface with a row of conductive bond pads thereon;

forming a planar substrate with opposing first and second sides, at least three elongate through-slots extending from said first side to said second side, each of said at least three through-[slot]slots configured for opposite side access between attached dies of said plurality of dice [to] and the conductive bond pads of a die of said plurality bonded to said substrate;

forming a pattern of electrical conductors associated with said substrate and having connection terminals adjacent each of said at least three through-[slot]slots for connecting said bond pads to an input/output [connection means] connector;

forming an input/output connector on said substrate and connecting said input/output connector to said electrical conductors from said bond pads;

attaching the active surfaces of a plurality of said plurality of integrated circuit dice to [a] said first side of said substrate wherein the bond pads thereof are aligned with alternate through-slots of said at least three through-slots for access from the second side of said substrate;

attaching the active surface of at least one of said plurality of dice to said second side of said substrate wherein the bond pads thereof are aligned with other alternate through-slots for access from the first side of said substrate; and

wire-bonding said bond pads of each attached die to connection terminals adjacent the corresponding through-slot.

In claim 45, line 1, delete "the step of";

In claim 45, line 2, after "in" insert --each--;

In claim 46, line 1, change "claim 44" to --claim 45--;

In claim 47, line 2, after "encapsulate" delete "the";

In claim 48, line 2, after "into" insert --each--;

In claim 49, line 2, after "between" delete "the" and after "of" (second occurrence) insert --each--;

In claim 51, line 1, after "44," insert --further-- and after "the" delete "further";

In claim 52, line 3, after "sides" insert --of said substrate--; and

912 54. (Amended) The method of claim 44, wherein the step of forming an input/output connector comprises forming one of a ball-grid-array and a pin-grid-array on one of said first and second sides of said substrate in a peripheral area surrounding said dice.

IN THE DRAWINGS:

Accompanying this Preliminary Amendment is a Letter to the Chief Draftsman deleting FIGS. 12 through 15 and submitting proposed revisions to FIGS. 7, 8 and 10. Approval of the revised figures is respectfully requested.